Having thus defined the invention, the following is claimed:

1. An apparatus for indicating a physical characteristic along the length of a welding wire traveling in a given path, said apparatus comprising: an induction coil surrounding said path; a source of AC current connected across said coil, a first circuit to measure the inductive reactance of said coil; a second circuit to compare said measured inductive reactance with a reference inductive reactance; and, an output device responsive to a difference between said measured inductive reactance and said reference inductive reactance to indicate the magnitude of said physical characteristic.

2. An apparatus as defined in claim 1 wherein said welding wire is a cored wire with an outer sheath and said physical characteristic is the wall thickness of said sheath.

3. An apparatus as defined in claim 2 wherein said reference inductive reactance is the inductive reactance across a reference coil with a selected reference core fixed in said reference coil.

4. An apparatus as defined in claim 3 wherein said reference core is a piece of welding wire having a desired magnitude for said physical characteristic.

5. An apparatus as defined in claim 4 wherein said reference core is a cored wire with an outer sheath having a desired wall thickness.

6. An apparatus as defined in claim 3 wherein said reference core is a cored wire with an outer sheath having a desired wall thickness.

7. An apparatus as defined in claim 1 wherein said reference inductive reactance is the inductive reactance across a reference coil with a selected reference core fixed in said reference coil.

8. An apparatus as defined in claim 7 wherein said reference core is a piece of welding wire having a desired magnitude for said physical characteristic.

9. An apparatus as defined in claim 7 wherein said reference core is a cored wire with an outer sheath having a desired wall thickness.

10. An apparatus as defined in claim 5 wherein said reference core is a cored wire with an outer sheath having a desired wall thickness.

11. An apparatus as defined in claim 7 wherein said reference coil is connected in a bridge with said induction coil and driven mutually by said AC current.

12. An apparatus as defined in claim 11 wherein said reference core is a piece of welding wire having a desired magnitude for said physical characteristic.

13. An apparatus as defined in claim 12 wherein said reference core is a cored wire with an outer sheath having a desired wall thickness.

14. An apparatus as defined in claim 1 wherein said welding wire is a solid metal wire and said physical characteristic is the diameter of said wire.

15. An apparatus as defined in claim 14 wherein said reference inductive reactance is the inductive reactance across a reference coil with a selected reference core fixed in said reference coil.

16. An apparatus as defined in claim 15 wherein said reference core is a piece of welding wire having a desired magnitude for said physical characteristic.

17. An apparatus as defined in claim 14 wherein said output device has a visual mechanism to display said magnitude of said physical characteristic.

18. An apparatus as defined in claim 2 wherein said output device has a visual mechanism to display said magnitude of said physical characteristic.

19. An apparatus as defined in claim 1 wherein said output device has a visual mechanism to display said magnitude of said physical characteristic.

20. An apparatus for indicating the wall thickness of a cored welding wire traveling in a given path, said apparatus comprising: a first induction coil surrounding said path; a source of AC current connected across said coil; a second reference coil connected to said AC source; said second reference coil surrounding a fixed section of cored welding wire with a desired wall thickness; and, an output device indicating deviation of the wall thickness of said traveling wire from the wall thickness of said fixed section of wire by detecting the inductive reactance of said first coil compared to said second coil.

21. An apparatus as defined in claim 20 including an adjustable resistor in series with one of said coils to balance the inductance reactance of said coils.

22. An apparatus as defined in claim 21 wherein said adjustable resistor is in series with said reference coil.

23. An apparatus as defined in claim 22 wherein said output device includes a LVDT having a first input driven by said AC current signal, a second input with a signal having a waveform controlled by the magnitude of the difference between said inductive reactance and an output based upon a comparison of said signals at said first and second inputs.

24. An apparatus as defined in claim 21 wherein said output device includes a LVDT having a first input driven by said AC current signal, a second input with a signal having a waveform

controlled by the magnitude of the difference between said inductive reactance and an output based upon a comparison of said signals at said first and second inputs.

25. An apparatus as defined in claim 20 wherein said output device includes a LVDT having a first input driven by said AC current signal , a second input with a signal having a waveform controlled by the magnitude of the difference between said inductive reactance and an output based upon a comparison of said signals at said first and second inputs.

26. An apparatus as defined in claim 25 wherein said first and second coils have substantially the same number of turns and the same lengths.

27. An apparatus as defined in claim 22 wherein said first and second coils have substantially the same number of turns and the same lengths.

28. An apparatus as defined in claim 21 wherein said first and second coils have substantially the same number of turns and the same lengths.

29. An apparatus as defined in claim 20 wherein said first and second coils have substantially the same number of turns and the same lengths.

30. An apparatus as defined in claim 20 herein said length is less than 6 inches.

31. A method of measuring deviation of the wall thickness of a cored welding wire moving along a given path from a desired wall thickness, said method comprising:

(a) placing a coil around said path;

(b) energizing said coil with an AC current;

(c) measuring the inductive reactance of said coil;

(d) comparing said measured inductive reactance with a reference inductive reactance relating to said desired wall thickness; and,

(e) providing an output based upon said comparison.

32. A method as defined in claim 31 wherein said reference inductive reactance is provided by a coil energized by said AC current and having a fixed reference core.

33. A method as defined in claim 32 wherein said reference core is a length of cored wire having the desired wall thickness.

34. A method as defined in claim 31 wherein said reference core is a length of cored wire having the desired wall thickness.

35. An apparatus for indicating a physical characteristic along the length of a welding wire traveling in a given path, said apparatus comprising: an induction coil surrounding said path with a length of less than 6 inches; a source of AC current connected across said coil, a first circuit

to measure the inductive reactance of said coil; a second circuit to compare said measured inductive reactance with a reference inductive reactance; and, an output device responsive to a difference between said measured inductive reactance and said reference inductive reactance to indicate the magnitude of said physical characteristic.

36. An apparatus as defined in claim 35 wherein said welding wire is a cored wire with an outer sheath and said physical characteristic is the wall thickness of said sheath.

37. An apparatus as defined in claim 36 wherein said reference inductive reactance is the inductive reactance across a reference coil with a selected reference core fixed in said reference coil.

38. An apparatus as defined in claim 37 wherein said reference coil has the same general length as said induction coil.

39. An apparatus as defined in claim 37 wherein said reference core is a piece of welding wire having a desired magnitude for said physical characteristic.

40. An apparatus as defined in claim 39 wherein said reference core is a cored wire with an outer sheath having a desired wall thickness.